Information System: Transport Dynamic Cartography in Alsace.

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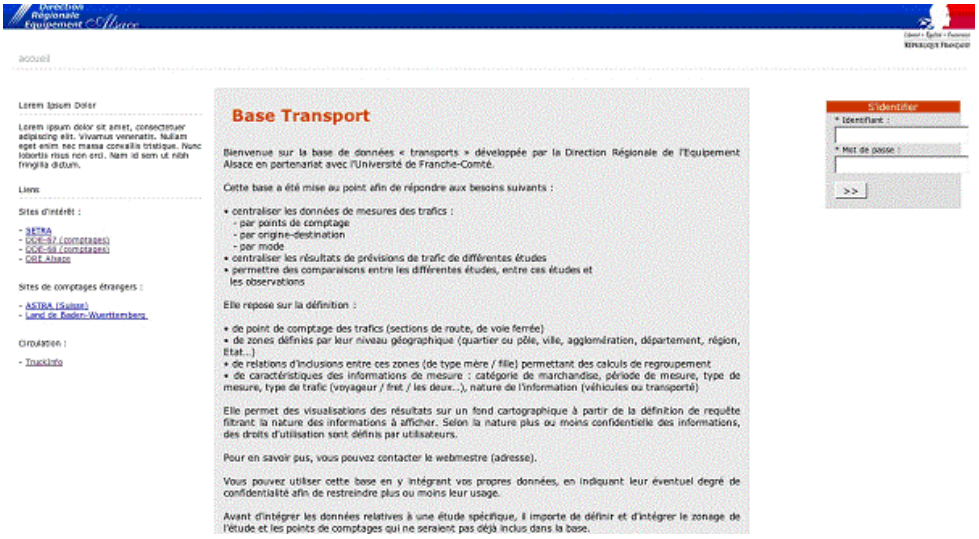
Abstract: The issue of the presented work is to publish on line a dynamic cartography system of the transport traffic evaluation, based upon the Alsace (France) regional level experiment. After a large design work of a transport database, arose questions about accessibility, data updating, choice of information processing systems, and development of Internet tools. Three points of view will be approached: the system design from the user point of view, the raised questions of communication and the data-processing. The synthesis allows analyzing the experiment of the installation of a Catalyse tool at a public State level service, at a French "région" level.

Diagram 5: Portal of transport dynamic cartography in DRE-Alsace (prototype)



INTRODUCTION

This study is strongly linked to the activity of the CAENTI work package 6 "Tools for actors". The on-line publication of a transport database dynamic cartography system is an experiment of the Territorial Information System, third tool of the CATALYSE toolkit (see CAENTI Deliverable 56 available on http://www.territorial-intelligence.eu).

In the Catalyse toolkit, the objective is to give to the user the possibility to build an economic web server of thematic atlas without high-level data-processing development that would be robust, easy to install and to set on a server.

Consequently, we should reach an easy-to-use tool for:

- publication and query resulting in series of thematic maps
- representation of the spatial entities that are compatible with a standard GIS
- management of their attributes in ordinary tables.

The Alsace (France) regional level experiment (presented here) uses this specific tool developed with AlovMap. The design of this kind of system was experimented in the framework of the SIGVille website project for the DIV (Inter-ministerial Delegation for Town). The website that resulted from this project can directly be seen at the address http://sig.ville.gouv.fr/, or *via* the DIV website (http://www.ville.gouv.fr/).

Three points of view will be approached to explain this research:

- system design from the user point of view,
- raised communication questions,
- data-processing. The synthesis makes possible to analyze the experiment of the installation of a Catalyse tool in a public State level service, at a French "région" level.

USER REQUIREMENTS

Transport data are quite complex to gather, use and analyse. In charge of transport policy at the NUTSII level, particularly of managing infrastructure projects, mainly on roads but also on rail or inland waterways, the Direction Régionale de l'Equipement d'Alsace decided to set up tools and methods to evaluate (*ex ante* and *ex post*) local transport policy effects.

It covers various aspects:

- Coordinating projects traffic evaluations (ex ante), mainly through traffic simulation
- Following effects of policy measures (forbidding road transit traffic accross Vosges moutains) or new infrastructure building (new bridge accross the Rhine river) (ex post)
- Gathering traffic data from special studies (truck origin-destination enquiry) or counts in a unique framework

The aim was also to build the framework which could be able to give to the user and in a simple way all the information about a specific network section or about the traffic between two zones. For an easy use, reports and maps were required.

Since important data were available in Excel or Access format, a database was needed and the available software environnement was standard office software, we firstly selected ACCESS.

The first part of the work was to define data structure and expected results:

As the aim was to make things sizeable, a clear and precise definition of data was required, with ability to make sums and data conversion:

Data would be provided at the more detailed level available from any study

Data record would be of two parts:

A-Data definition set on the following parameters:

Source description

Data type: either concerning vehicles or transported items

Traffic type: passengers, freight or both

Traffic type (2nd level): NST for freight, kind of travel for passengers (Local…)

Mode of transport

Reference period (peak hour, yearly day, open day…)

Reference Year

B-Traffic volume:

For information about a specific network section, data would be: network section reference, traffic volume, origin and destination if available

For information about a traffic, data would be: traffic volume, origin and destination

For flows (origin – destination) calculations, acute geographical information were needed. The most important issue was to set hierarchical level and grouping types in order to allow sums over subarea information.

16 levels with 8 ranks were defined, and the database structure used grouping facility for zones, enabling to know if it was possible or not to sum data in order to answer a particular query.

But the unique form was never achieved, and the geographical calculation therefore only worked partly.

A cartographic interface was set up to give results, but also to update data, through static forms. Since no zooming or interactive cartography was available, a new form had to be developped for new perimeters. At the end, the database had 6 different forms.

The second part of the work was to set up the updating process.

The various available studies, with their own zones, their own network or data specifications, led to set up almost one process for each new study to integrate. Specific queries were needed with sometimes even new tables to be added.

Towards an online system

The access database was of great help but had also very important limiting factors:

- It was not possible to allow various rights to different users (other than all or nothing manipulation).
- Changing the area of interest would lead to build new forms, which was quite harmful and time expensive…
- Origin – Destination query never completely worked, what lead to the need of several forms and even several tables.
- Importing study data was often complicated.

For these reasons it was decided to move to an on line site. Specifications were built from the Access database and debated between the DRE and the MTI.

COMMUNICATION QUESTIONS

The use of on-line information systems is different from the classic navigation (which corresponds more to discovery, leisure activities, or purchases oriented). Most of the time used in professional environments, the object (portal, website, intranet or extranet, cooperative space) is above all perceived and used as a tool, so as to make a regular work. Then, the navigation is a medium to choose the tools that are in a suitcase, what generates questions linked to usability.

Now, the recommendations in IHM and in ergonomics are most of the time acquired, understood, experimented, and finally set up in an often effective and relevant way. However, they only partly approach the use issues that are generated by these online information systems. Thus, convoking these recommendations is essential during the design and the shaping of the system. However, questions about neither meaning, nor reception, nor knowledge building, nor getting in touch, nor above all communication objectives are asked.

The toolkit, to take back our metaphor, can be conceived to store the contents in a practical way thanks to these recommendations. However, they help us neither to understand what is of use in such tool, nor how we can use it, nor how the relation to the tool generates new uses and new knowledge.

Semiology brings a certain number of notions we can organize to clear up the questions linked to meaning and understanding (Masselot 2006), hence the name eSémiotique or SémioNet. Numerous research activities in this field are in progress. The system of transport database dynamic cartography is an object which feeds them, by also allowing appealing to the concepts and the notions of the information and communication sciences.

This experiment investigates the contribution of these research activities in the design and in the present building of such a system, by taking into account the transition - transcription of an off-line pre-existing tool to an on-line system, the dimension of multiple uses, and a communication strategy which can be imagined in this context.

On-line software: mutualization and collaboration

The on-line publishing of such an information system results from a strong political will, which widely exceeds the mere information production. The project was not built *ex nihilo*, because an outstanding software was already designed and previously used. The expertise (assessment) led on this product demonstrated many limits, which advocated for the updating to an on-line system (cf. 1 User requirements):

- At the end of 2004, the transport database was approximately 170 Mb large, and accused several minutes waiting times for some queries.
- The content had to evolve in a more fluid, faster and more simply accessible way
- The supply, as the use of the base and its content, inevitably had to exceed a restricted number of users, at the same moment within the framework of the public mission of the regional structure, and in that of the ministry of which it is part.

The design of the on-line system is necessarily fed by these principles, and also asks new questions linked to the internet opportunity. The public concerned by this system largely widened: at first, the aimed public was the DRE Alsace staff, with an opening planned for outside users (for example to the data suppliers from external structures, for example SNCF). The aim is to use this system as a mutualized tool by observation of flows and traffics, handbook and updating, combining quantitative statistics, dynamic cartographic representations, additional documents (statutory texts, standards…). It implies some users called “experts” are able of managing the content.

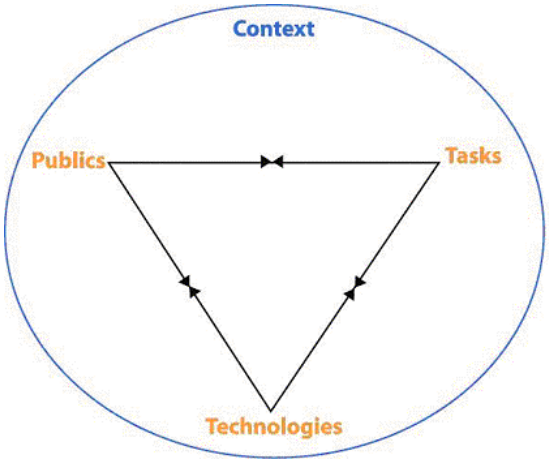
The dimension of the collaborative work which ensues from it pulls then the consideration of the variety of profiles for the public, the possible actions (services offered by the system), and available technologies allowing answering these expectations. In particular, the on-line available modules improve the opening of an off-line software in the other uses, related and useful for the first objectives, as the access to specific documentation, to illustrations (fixed or video) giving a visual representation of the flows environment, or still as a specific forum guaranteeing the exchanges within a thematic community which can then find an existence and a professional valorisation.

Use design: expert and general public

The conceptual analysis of the system brings to light a crossed board between the necessary actions (rubrics of the portal) and the manners, according to the target public.

The access to the portal requires an identification which authorizes or not, in a classic way, the display of some tools according to the user's profile.

Diagram 6: Conceptual analysis.



Analysis of the "target" public

The conceptual analysis begins with a **detailed study of the public(s)** that is/are concerned by this project. The "target" publics, in the commercial meaning of the word, should be taken into account: to who is addressed this project? What are the messages this project will deliver? Practically, it is necessary to wonder about: for whom are we working? To whom the results are addressed? Who will use this work, the devices? Which actors will contribute to create these devices?

This information will be used to choose the constituent elements of the project according to the profile of the concerned publics: if it is a researchers' community of the same discipline, we will for example be able to use the scientific vocabulary of their domain; in the same way we will be able to choose a layout coherent with the use frequency of the product, as they are recommended by the conception techniques lauded in Human-machine interaction and in Semionet [Masselot & Bougenies 2003]:

"The means of communication evolution implies the necessity of a permanent control of the meaning produced by the used and published supports. Consequently, a detailed and evolutionary knowledge of the public-target motivations and expectations became particularly important for the majority of the companies that want to build a coherent and thoughtful communications strategy."

We can read on the previous diagram, from the pole called "publics", an arrow joining another arrow from coming from the "tasks" pole. Indeed, the identified needs will allow a first estimation of the tasks the product will have to perform. In a similar way to a system of search for supply – demand adequacy, the analysis work of the public needs will have to lead to a well-framed evaluation of the actions that the end product will allow. It will thus have an influence on the determination of the tasks. It will also have a not neglectible

importance as regards the choice of the technologies which will be used (other arrow towards this angle): according to the motivations, but also to the professional, individual skills, as well as the desires of the target publics, the system will have to offer (or not) a certain level of online help, or on the contrary a thoughtful and necessary complexity in a reflexive progress allowing making a decision… whilst completely respecting the capacities of the various discriminated publics.

In summary, when it is a question of designing a computing, organizational tool, a form, or an action, we can think that we will have to take into account the following factors, during this analysis of the users:

- Psychological: learning speed, memorization capacity, curiosity
- Physical and physiological: size, weight, right-handed / left-handed people, visual acuity, dexterity, resistance and endurance in a task
- Sociocultural: studies level, formation, gender, social origin, linguistic and general culture …
- Professional experience, level of competence in the task
- Thematic sensibility, capacity of hindsight (meta-attitude)
- Position in an organization chart, personal stakes

Obviously, all these criteria are not compulsory for every project: it is rather an overview than about an exhaustive summarization. In this specific project, this evaluation was led during the design phase, which concrete expression is the specifications, which resulted from it.

The objective of the presented project is to open the current system to other users whilst improving it, so as not to repeat the current limitations which limit the “base transport” to an almost exclusive use of a single person, both at the level of the data key-in and at their consultation one. A genuinely multi-user use was difficult for several reasons: the first one is the base initial format (managed by Access), which offers limited possibilities for the use by several people (the maximum is about ten simultaneous connections); coupled with the slowness of most of the queries, as a consequence the use in network was not really conceivable. Furthermore, the complexity of the exchanges in network between the various sites of DRE Alsace does not facilitate neither the multi-user systems.

The ideal scenario is obviously the base Transport is not limited in this way any more, namely a mono use user. The transfer towards an on-line accessible data base, should enable a much less binding implementation compared with the limits of the DRE network, and also facilitates the access to the base for all the potential users.

Thus, as a web-site is by definition accessible to a large number of simultaneous users, it is logical to design a new version of the “base transport” as a multi-users system. It implies user profiles and access rights identification. Indeed, the Access single user limit is technological. As soon as this limit will be overcome - what is the case with a transformation in a web version - other persons of the DRE Alsace will be able to use the base Transport, as its contents can be profitable to their missions.

The public eventually defined is firstly the entire staff of DRE Alsace, with a foreseen widening to external persons (data suppliers from external structures, railway companies as SNCF for instance). It requires an access to the site of the base Transport by internet, so as the external users can access them.

Besides, it emphasizes the necessity to implement a users' and users' rights management. Classic system within the framework of broadcasting contents on the web, such a system allows giving access to some actions on the website, through a login and a password.

Within the framework of the base Transport, such a management system is interesting for several reasons. First of all, it allows securing the data, because only the authorized persons can key-in new data, modify them or delete the existing ones. The other users only have a consultation right, on all or part of the base. In addition, such a users' management also allows having an important flexibility as regards the evolution of the base uses rights. For example, if the system should be opened to a limited group of responsibles from other regional DRE, for purposes of free consultation or of mere demonstration, creating a new user account and transmitting the login and the password to the concerned persons will be sufficient.

Several different rights are available. The base various users' profiles are defined according to the rights which are assigned to each of them. Thus, it is possible to distinguish several "basic" profiles that are linked to the good functioning of a multi-users site.

- **Administrator profile**: the administrator is one of the rare persons who have all the available rights. He is in charge of the base. He can add all types of data, modify them and delete them. He can also create, modify and delete new users.
- **Data supplier profile**: this naming characterizes the users who are able to add data and/or modify data. For security reasons, the suppression right is in principle reserved to the administrators. Thus, this profile is intended users susceptible to be able to add new data to the base. It seems necessary to set up declensions of this profile, according to the data the users can add. A person in charge of countings will only have a right to add countings to the base, the management of the other types of data being unavailable for him.
- **Lookup Profile**: this profile is the most restrictive, it is the user profile which is assigned to the larger number of people. In this case, users have no action possibility on the stored data, they can only consult them. It includes the functions which are necessary for consultation, search, sorting, etc.

  Data consultation can be filtered according to sources. The objective of these limited lookup rights is to restrict the diffusion of some data to the external users.

A latest right that is independent from these typical profiles is also necessary; it is the right to **save item selection**. These particular recordings, planned for the counting points and the traffics (and the zones aggregations if it is validated), allow protecting a selected set of data for later direct access. This recording function is reserved to the users who are authorized

to make these selection, but then all the users can consult these data in direct access. Thus, a right of "selection saving" should be assigned to get this functionality.

The various rights that can be allocated are the following ones:

- Right of addition / modification of countings (for every addition right, authorization of manual key-in and import)
- Right of addition / modification of counting points
- Right of addition / modification of traffics
- Right of addition / modification of basic data (gathers the data except concerning the zones/. counting points / counting / traffics)
- Right of addition / modification of zones
- Right of deleting counting points
- Right of deleting traffics
- Right of deleting basic data
- Right of deleting zones
- Right of selection safeguard (includes the modification and suppression of these safeguards)
- Right to export data
- Right to manage users (creation / modification / suppression)
- Right of management of the homepage news (addition / modification / suppression)
- Right of consultation assigned by source. The management interface of these rights should be studied, but it seems necessary to be able to authorize every thing, restrict to some sources or only authorize some sources, so as the attribution of the consultation rights are efficient and quick in every case.

During creation of his profile, a new user does not have any particular right, he can not see any datum. Thus, it is necessary to attribute at least a lookup right during the user's creation. Given the consultation can be limited, this choice is compulsory not to spread data by mistake. A rights management module is planned to settle these parameters.

Task analysis

To set up an activity, whatever it is, a sequence of actions with an unpredictable order, is incontrovertible. Every task is accompanied by a series of sub-tasks which will allow the planned execution. Thus, we observe a structured organization, of an action in tasks and then sub-tasks, and the latter are then sequenced in sub-elements, like the insetting of Russian dolls. Consequently; it is important to unwind the hank of the deliberate action, in order to organize its elements, by logical group, and in the course of time.

It is strongly recommended that at every stage (every intention of action, of product) a stage of **analysis of the tasks and under tasks** is made. By qualifying the led project, this

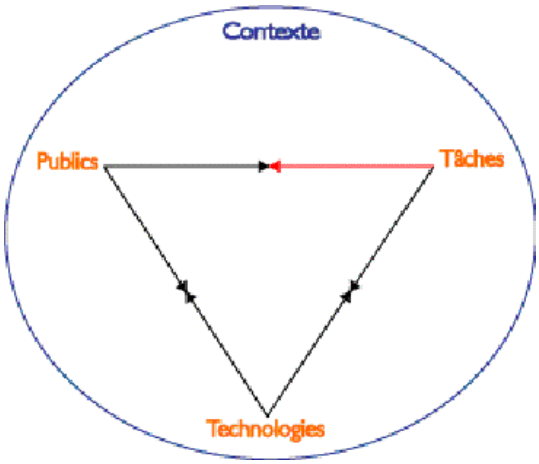
stage also allows organizing it structurally, and in the time. It will be the base of the editorial work, for example, of a retro-planning (which type is the Gantt diagram). The link with public definition is important: indeed, it is sometimes necessary, or even indispensable to gear down an action various execution moments to facilitate its achievement and to guarantee its quality. On the contrary, it is often recommended, in study of human-machine interaction, to reduce the number of actions to be made, the number of elements to be manipulated, to avoid problems of cognitive overload. The famous rule "too much information kill the information" has grounds. In the theory of the human processor [Card, Moran and Newell 1983], the knowledge engineers explain the memory has its own limits, in terms:

- of capacity: number of remembered elements, between 5 and 7 mnems for the short-term memory
- of persistence: time at the end of which the probability to find an information element is inferior to one over two
- of kind of stored information: according to the memory type, physical, symbolic…

These are part of the theories that are taken into account during the navigation design, and of the portal interface.

The tasks definition has an assured influence on the target users. All of them can not be trusted to the same person, and all of them can not technically be executed by whomever because they involve specific skills to some users' profiles, as the data management (import-export for example) or the cartographic data that inevitably appeal to deep competences in this field. A determination of users' profiles should be made, when the identified tasks will only be able to be made by these categories of individuals, what explains, in the diagram of conceptual analysis we already presented, the arrow that goes from the tasks towards the targetted public:

Diagram 7: Conceptual analysis: tasks influence.



These jobs with responsibilities were found in this project with this device; specific trainings will be necessary, as well as the appeal to certain specialized professions, especially in cartography and statistics.

Debate around technology

During the project design, it would be excessive to say the technological aspect is the less important: the contemporary professional cultural heir of a dichotomous thinking system where someone is either technical or romantic tends to leave the technicians making the technological choices (computer specialists, infographic specialists).

According to the arguments that are presented above, it is not always possible to take into account the decision-making process between the application of an advanced technological degree that will allow making the planned tasks and a product, that could require more time to be made or could be heavier to make, but that would have an easier handling for the users. It is incontrovertible to know not controlling all the possible computer programming techniques and languages, but to be able to handle indicators and criteria that will allow making this kind of decisions.

The "***veille informationnelle***"(informational intelligence) is a necessary tool in this perspective: it is also a question of not starting a heavy development, with languages and technologies without future, without technical support, and which would be soon thrown away. Again, we will not be able to ask a doctor, who has become project manager, a foreman, a manager of associative structure, to acquire the technological knowledge necessary for the proper guidance of project, in addition to its professional knowledge. Nevertheless, he will have to know bringing to his activities the necessary skills, he can estimate the relevance level of the work being made and suggested choices, and he regularly faces the cogs of the tasks and procedures to estimate the necessary time to program computer and to execute a simple or complex statistical processing.

The technological choices are strongly influenced by the analysis of the targetted publics (users, beneficiaries, designers, directors, computer specialists), and, as the task specification for such staff category, there will be an evident effect of the taken decisions on the typology of the potential users. Indeed, some necessary and unavoidable tasks lead to the implementation of detailed and expert technologies that are only accessible to the individuals who have a certain level of technical control.

An authorized study compared three technical possibilities taking into account the previous élémens: at the moment, several " technological schools " are confronting for the creation of "simple" on-line cartographic systems (that is to say projects such as ViaMichelin or Mappy, to only quote them); it is the ***svg*** format, the Java programmes such Alovmap[17], and systems created in ***Flash***, as Géoclip[18]. The first result of their compared study is that AlovMap remains the most interesting system because of its use flexibility and the acquired experience, whereas the svg format is advised again, and Géoclip requires a

[17] Alovmap website: http://www.alov.org

[18] Géoclip website: http://www.geoclip.net/fr/index.php

narrow partnership with the company of the same name, as it is recapitulated it the following dia.

Software	Technical Constraint	Advantages	Disadvantages	Price
Svg format	IE 5+, adobe SVG Viewer	- Simple to develop: writing similar to web pages - free system	- Bad distribution of the reader svg, little used techology - reserved to Explorer, in speed loss	Free
Géoclip (Flash)	Plug-in Flash	- Very wide-spread, effective technology - geographical system in the most "salesman" aspect - advanced cartographic features - plug - in light	- proprietary system - Advanced use requires contemplating the execution of the project by the company Géoclip.	24000 € (source: http://www.geoclip.fr/fr/p21_produits.htm)
AlovMap (Java)	- Virtual Machine Java on the client PC - Client mode of AlovMap server: Apache Tomcat on the server (free)	- vey good cartographics functionalities - free system	- Plug-in Java harder to install than Flash - much inferior aesthetics than what Géoclip can suggest	Free

The chosen cartographic module is AlovMap. A technical question still arises further to this choice. There are two versions of AlovMap, the first one is the "applet" solution, the second one is more advanced and can be called "customer version server". In the first case, no server technology is necessary, the only pre-requisite to the use of the AlovMap applet is the presence of the plug - in Java on the user's computer. On the contrary, the customer version server offers more functionality, but requires the implementation of the free server *Tomcat* to manage the server side. The customer version server particularly allows loading only the ***shape files*** that are necessary for the asked display zone, contrary to the applet version which loads all the files. As a consequence, the customer AlovMap server can notably reduce the waiting times during the loading of the cartographic module. These technical elements are presented in the following chapter.

Context

The last element of the conceptual diagram we presented above is the ***context***: each action, whatever it is, takes place in a precise context. Cultural, social, professional, ambient, determining context are working conditions to be taken into account as much as possible where the project is being designed. The first parameter to know is the context where the project takes place: places, history, previous and present policies, legacy and traditional values… are the elements that will allow estimating the importance of the project in the concerned zone, according to strategic stakes. The analysis of some ground executions shows that such stakes sometimes lay in the realization, and that a thematic, that was not a priority before, is merely underestimated.

It is generally preferable to obtain this information before beginning the conceptual analysis, because their influence is very strong on the three poles, and consequently avoids

wandering around some questions. Do decisive differences as the writing and reading senses should naturally be taken into account? The tasks analysis will always need to be fed by contextual information: the concerned users evolve in a particular culture, with their own universe of cultural referents, which will be able to be used as a basis, not to have to lead some explicitations. It is in this sense, that we previously used the notion of expectation horizon that is inherited from the semiology: a situation, a context, are "read" from these cultural universes which contrive the apprehension the individuals have of the project.

The analysis of the context naturally completes as the poles analysis goes along. Thus, we generally advise to establish the four elements in a bound way during this design phase: firstly, each of them in a separate way, not to get lost in guesses, and then to resume the whole in a sommative analysis to work on the interdependences links (the influence arrows from a pole to another one), in a clear context.

Its definition in this project allowed clarifying the DRE functions, the project stakes for the institution, and for the project partners:

- DRE Functions:

The Regional office of infrastructure of Alsace (DRE) is responsible for several missions linked to land planning, transport and housing. These missions include projects of arrangement, transport infrastructure implementation and observatories on various questions, such as traffic regulations, road safety or housing. A complete presentation of the DRE various functions is visible on the official site, at the url: http://www.alsace.equipement.gouv.fr/

Transports have a pregnant role in the problematic of all these missions, including those who are not directly linked to it. Indeed, the transport of persons and goods is strictly linked as to the geographical scheme, that is to say the housing, as to the problems of land settlement.

- Project stakes:

Transport problems influences all the DRE missions. Thus, it is very interesting for the DRE the available statistical data can be easily shared between the various services. Initially, these data were centralized in the Access monopost version of the base Transport and the diffusion of these data was extremely limited. The major stake of the project, if we consider it at the level of all the DRE services, is to make available the transport statistical data for all people, and to have the base fed by many of them, in a collaborative way. Real strategic stakes are being built:

- in terms of governance, because this portal is an observatory feeding a decision-making process that is at the same time technical, administrative and political.
- institutional, because the DRE should play its role in this process, and by being the mainspring of such an experiment, it can maybe then value its work by a transfer towards other close or identical structures.

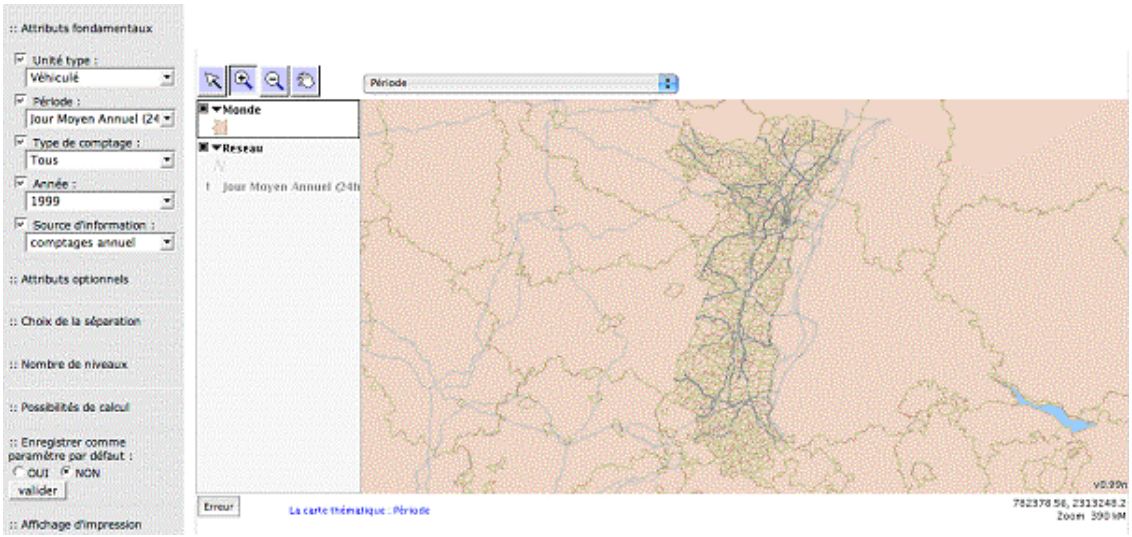
- in terms of service (Service de la Maîtrise d'Ouvrage), because the service in charge of the project shows its dynamism, its professional creativity, its concern to improve current tools.
- Individually, because the persons who are involved in the project have to answer an interesting challenge in design, project follow-up and in technical execution, and this challenge can be professionally productive.

- Services participation:

Several services of DRE Alsace were associated to the project, to assure its good progress and its success. The main interlocutor is the SMO (Service de la Maîtrise d'Ouvrage). The communication service of the DRE has a consultation and validation role for the graphic charter applied to the project. Finally, the cartographic needs of the project (choices and elected standards, cartographic data dissemination) are processed with the staff of the geographical information system (GIS), and of the Service of Regional Observation. Eventually, the DRE computering service was consulted about the various possibilities of technical web-hosting of the project.

In this project, the idea was to add two levels of use in some menu items in the interface. These levels are not inevitably managed by the automatic profiles, but by the users according to their needs at the time of the navigation. Consequently, in the use of the dynamic cartography, a contextual complex menu was generated, allowing real time interaction with the parameters of the created map. Most of these parameter settings ask for a real level of expertise on the contents (sources knowledge, gathering conditions, available criteria…), on the statistical methods of the information processing, as well as on the cartographic principles and the geomatics.

Diagram 8: Map of Alsace (France) counting points.



By default, the left menu reflects the statistical and cartographic choices made by the experts on the subject. On the other hand, all the menus are not displayed, so as the use levels are respected. Thus, a simple use will not be perturbed by a variety of too technical choices, however they remain available for an expert use. The idea is to guide the users, by giving a direct access to the simplest level.

Most of the concerned public do not perform all these conditions; presence of a complete menu authorizing all these modifications appears heavy, not to say bothering, in a not expert context of use. It is thus a question of structuring this type of menu to give access:

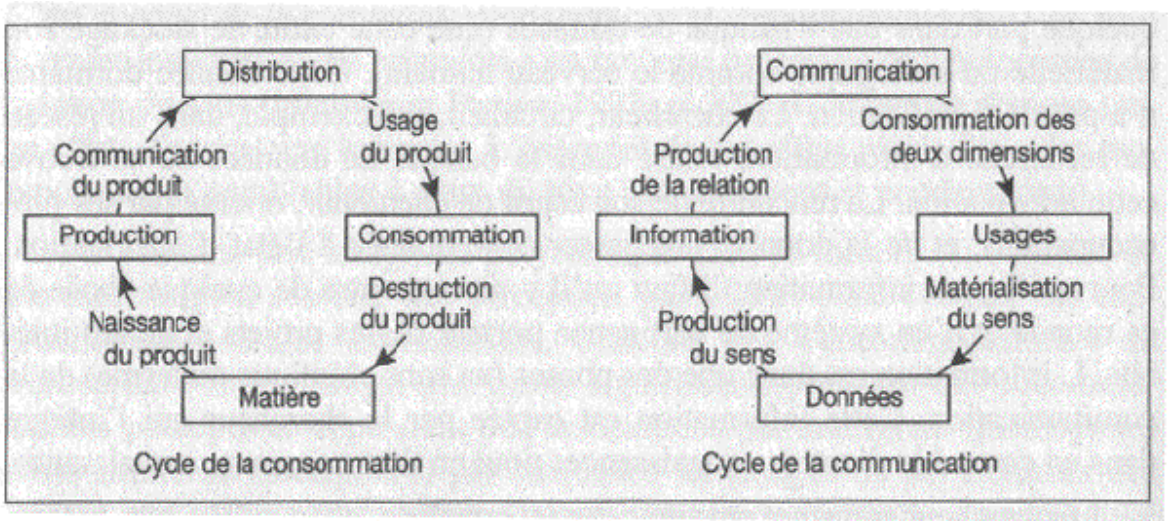
- At first to a minimum of basic tools, at once understandable and widely sufficient for a cartography, that does not require complex parameter settings
- In a second time, by "unfolding" the menu, in the various complex parameter settings appealing to these experts, said questionings.

This structuralization of the interface is still at the experimental stage, because the other modules of the portal could certainly take advantage of the same analysis and consequently win in use simplicity.

GIS and communication

This system, in a simplified way, allows organizing a process which goes from data to information, communication and way of use. Mucchielli (2003) develops this idea in what he names the communication cycle that he illustrates:

Diagram 9: Communication cycle by Mucchielli (2003).



The system feeds on data either gathered from various sources, or internally built. It structures them in a data base (cf. third part), and organizes three stages presented in the scheme:

- Stage of signification production that ends in useful and usable information
- The communication putting into relation information and users
- And finally the use way of "both dimensions" one.

The information production is generally well designed and experimented by the research activities led in human sciences (geography, economy…). The question of putting into relation often remains to be clarified, as a dimension which is not still approached during the design of this kind of project, whereas it is fundamental to guarantee the relevance of the way of use in a professional environment, which appeals to a scientific level, nevertheless it is difficult for a wider public to approach it.

According to Wright (1973), this putting into relation between information and users, with the environment, is one of the levels to be analyzed in mass communications, where the environment gets a social perspective, that is here professional.

Thus, the design of this kind of system appeals to the notions of mass communications, as well as to those which are exploited in the scientific communication, as the principles of vulgarization, mediation and mediatization (Masselot, 2006). These statements allowed, for this project, thinking over the process of information building, and over the communication one, on the mass media uses point of view and of the scientific mediatization.

Prospects

In terms of communication, specific studies remain to be led, in order to validate the first reserved options, and to improve the constructed system:

- Analysis of the human-machine interactions and user ergonomics,
- semiological, informative and communicational analysis, allowing approaching the expert and administrators way of use, as well as those of a larger public.
- The technological overhangs (cf. conclusion) will generate new questions which it will be advisable to approach on the communication process point of view.

COMPUTER SCIENCE ASPECTS

How a TIS generally operates

Basic data: geographical support and attribute data.

The data that are manipulated by most of the so-called vectorial[19] GIS formally and logically distinguish two-sub sets:

[19] The vector mode suggests the description of geographical entities under the form of series of points located by coordinates [X,Y]. It is traditionally opposed to the grid or raster mode that represents the space under the form of a regular canvas of elementary cells that generally have a square shape: the «raster» mode gets close to the digital images but it is different from them.

- the geographical support that is composed by entities that are described under the form of points (example: wells), of lines (ex: roads or level curves) or polygons (ex: communes or forest parcels), that makes a spatial description of localisations or objects that are located on a reference plan[20]. We use the word «cover» to refer to a regional set of entities that have the same kind and are gathered on the same logical structure: we can sometimes imagine it as a map background.
- The assigned data, which characterise the geographical entities.

Identifiers.

Each entity has a particular identifier (for example, the INSEE code of a polygon-commune) that we can also find in the assigned tables that are linked to this family of entities. When it is possible, it is advisable to use normalised identifiers (for example, in Portugal, the DTCCFR codification – 2 numbers for the *distrito*, 2 numbers for the *concelho*, 2 numbers for the *freguesilla*). The European Commission also suggests a codification that is called "NUTS" for all the administrative cuttings about the Union. The toponyms are poor identifiers, because of their complexity (composed names), of their repetitions ("Saint-Martin") or of orthographical problems (accents, hyphens…).

Covers.

ActiveMaps exploits covers that are coded in shapefiles (extension .shp and .shx), this ESRI standard for ArcView is presently the most used for the data exchanges. When it is possible, it is advisable to obtain (even freely) the covers from specialized organizations (example: website of the CNIG in Portugal): all the problems of previous formalisation, homogeneity and updating are rejected. When there are not the wanted covers, it is necessary to use a GIS (even a light one: ArcView, MapInfo…) to make these covers preparation. We will do the same as regards the frequent updating problems.

Among the other logical formats of diffusion of the geographical information, we can also quote:

- MIF (MapInfo) that has a specific interface for ActiveMaps et AlovMaps by MIF2SHP.exe
- E00: export Arc/Info (interface IMPORT71 peripheral of ArcView, independent from the ESRI keys)
- XYZ: ascii files that describe points (coordinates and users, can be imported for ActiveMaps and AlovMaps by DBF2IGIS.exe, after having converted the dbase format)

[20] The reference plan is generally a representation of the Earth surface, which is determined by a projection system. These projection systems are particularly varied in the world –even in a same country; thus, in France several different systems (according to the latitude and to the scale) are built according to the conform conical Lambert projections, but NATO uses more the UTM (Universal Transverse Mercator) system. The definition of the projection and of its parameters are part of the geographical support: they should be carefully kept to allow ulterior modifications.

- SDTS (Spatial Data Transfert Standard, standard that is imposed for little time by the US administrations; it will probably develop on the market).

Assigned tables.

ActiveMaps and AlovMaps use the ArcView conventions: the attributes (example: the communal data about population) are stored in dbase (.dbf) tables, that concern the same radical as the entity files (there is also a possibility to connect to external DBMS)

These tables present the descriptors in columns and the entities in lines. Three points deserve we pay a special attention to them:

- The field names of the descriptors should be brief and should only include standard characters (majuscule letters and numbers, to avoid any problem);
- There is no calculation tool on several fields in ActiveMaps: the rates, the ratios, the densities, etc… should be previously calculated, for example with ArcView or Excel;
- The link between the shapes and their data is not dynamic: it is managed by index at the GIS level. The lines (records) of the assigned tables should be cautiously used: neither sorting nor adding nor destructions… On the contrary, it is possible to modify the columns (fields), except the identifier one.

Functioning of a TIS with Alovmap

Architecture of the website with Alovmap Server

An online TIS implements an architecture that is called of the «three-thirds». This structure makes a difference between three levels:

- The client, who communicates by the means of his web browser
- The server, that processes the client requests'
- The data, that are stored in a DBMS

The client needs a web browser (whatever it is) and that the virtual machine java is set-up on the used computer (very often, it is set-up at the same time as the computer system, which can be Mac OS, or Windows). We can freely download the set-up of this virtual machine java at the address: http://www.java.com/.

On the server side, the configuration is more complex. It is composed by:

- A web server Apache
- With its PHP interpreter to communicate with the information of the data base in a dynamic way
- That is managed by the MySQL DBMS
- For the cartography on Alovmap server, an additional configuration is necessary: it requires a server of Tomcat applications which, by the means of its servlets engine,

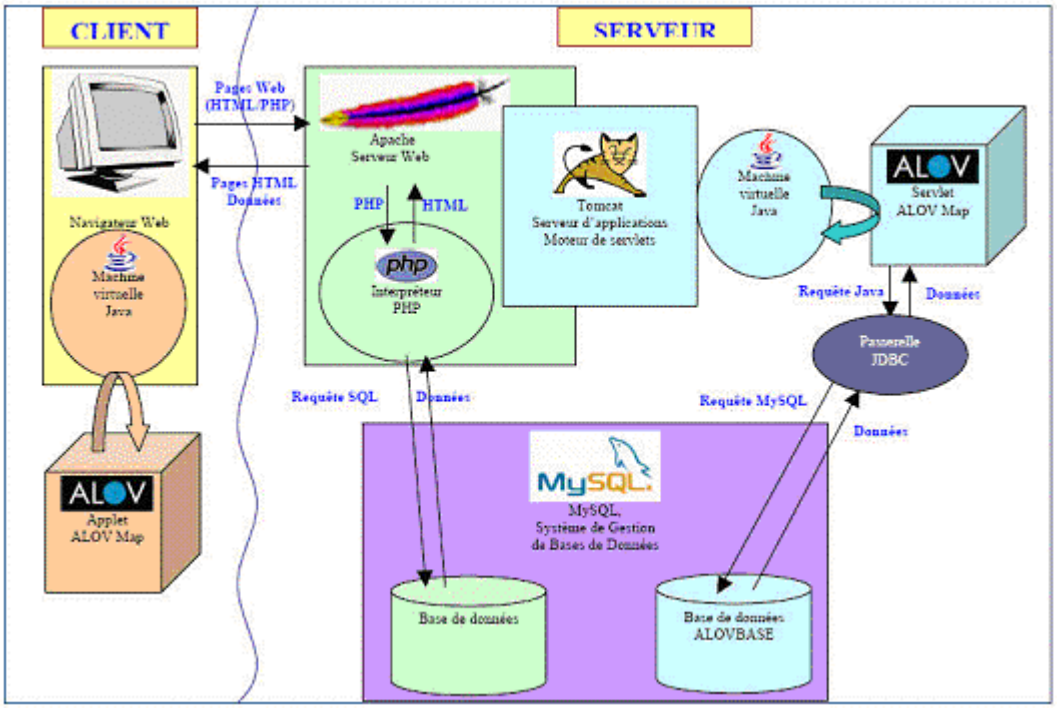
connected to the java server environment, allows executing the servlet of ALOV that also connects to the DBMS.

The data base stores many of the data that are necessary to the application, in particular the data that are linked to the gross data, but also some geographic ones. These geographic data are:

- The coordinates of the centre of the zones that will directly be registered at the level of a «zone» table
- The geographic data that are linked to the lines that represent the geographic objects to be represented (points, roads, traffics, rivers…)

As regards the base maps, they are separately registered on SHP and DBF files

Diagram 10: Typical architecture.



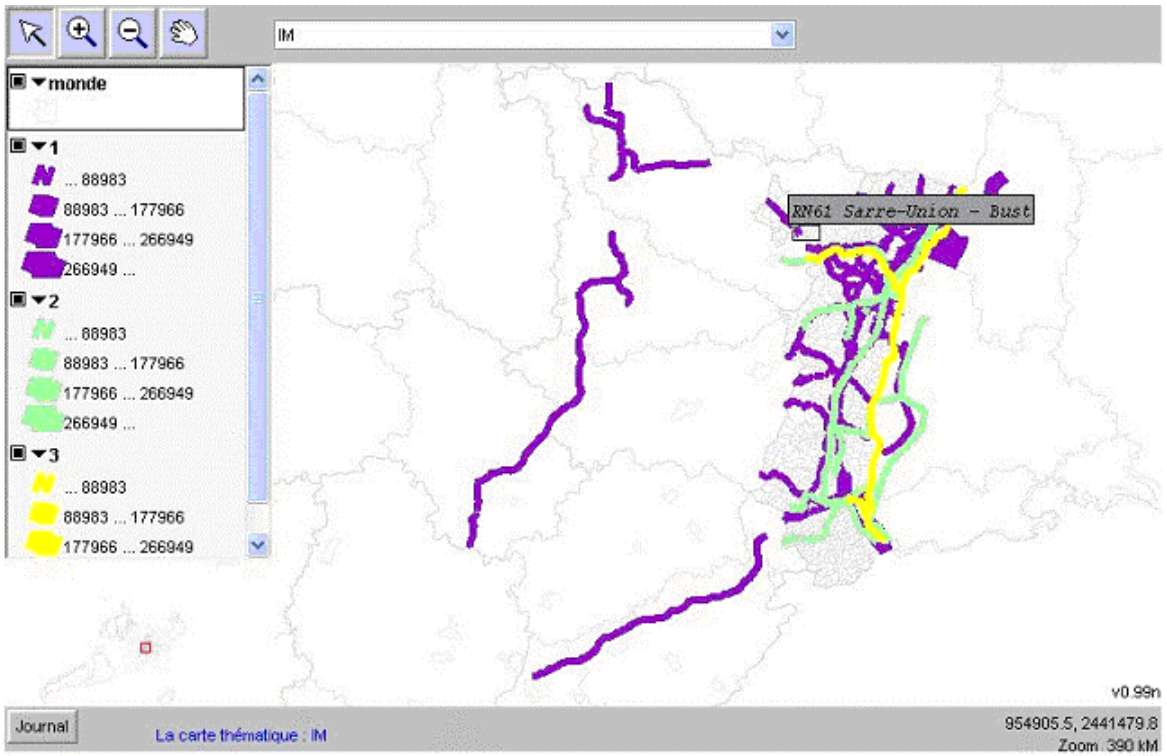
Alovmap can work either in applet or in servlet.

In applet, the geographic data are memorised in shp and dbf files, whereas in servlet these data can be memorised in a data base, that allows dynamically managing these data.

Thanks to the data base, it is possible to select only the information that should be necessarily displayed and sent to a client. The data of the selected elements will be the only ones that will be sent to the clients. Without a data base, this selection is more complicated to make and less performing because it would be necessary to dynamically create DBF and SHP files.

Elements of the cartographic module

Diagram 11: Cartographic module.



The cartographic module has several elements:

- A toolbar that includes the wording of the layer attribute and 4 buttons:
  - A button to get the selection tool, either by clicking on an element or by drawing a selection zone (rectangle on the image). Passing the mouse on a count point displays its name (the frame «RN61 Sarre …»)
  - A zoom tool, either by a simple click or by drawing a selection zone
  - A tool to zoom off
  - Lastly, the hand is used to make the map glided (it is possible to make this with the click right of the mouse even if another tool is selected).
- A legend zone that records the value of the various lines (layer value) and the size of each line (by range). As regards the traffics origin, it is directly proportional to its value (and not to ranges like the lines) but it is calibrated on the lines size, according to their value.
- Lastly, a status zone that includes a log file (where we describe the loading and above all where the errors are written, if necessary), plus some other information (for example the zoom level).

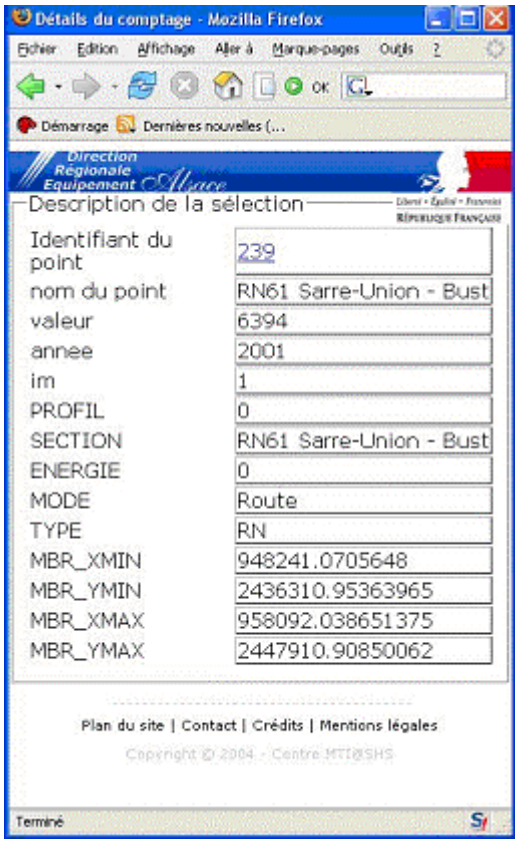
Selection options

The selection of counts or traffic(s) point(s) opens a window.

There are two kinds of windows: one is used if only one element is selected and another one is used if several elements are selected.

In this second case, the window includes a descriptive simplified list of each element. From this list, it is possible to display the second type of window, which presents a more detailed description of the selected element (count or traffic point). It also allows linking to the descriptive page of the count point or to those of the origin and destination zones.

Diagram 12: Selection description.



COMPUTER SCIENCE CONCLUSION

The portal is presently a prototype, and its hosting in transfer to a platform of specific production. Consequently, an evaluation will have to take place after its official launching to improve its possibilities.

The used technologies are necessarily already exceeded if we refer to the current overhangs, where new more advanced solutions appear. The dynamics of the technical and conceptual creativity progresses according to a temporality in advance in relation to the

applications. It is advisable in a next phase to establish a new analysis of the existing and tested technologies, by taking advantage of the possibilities offered by Web 2.0, and even soon 3.0, and to develop this product this way.

ACHIEVEMENT AND FURTHER WORK

The next step is of course making use of the new on-line site. A validation period, requiring test users will start soon, to check all the process.

At the same time, work on GIS objects (networks and zones) could be carried on, in order to give a better look (several zones or network sections have been quickly shaped and would need some redesign). At the same time, the use evaluation can generate new questions about the creation of information process and about the communication process (for example new relationship, new public…). The data processing translation of this point has to be organized with the results of the CAENTI WP6, and maybe with a new technology (Web 2.0).

In a second time, site diffusion and publicity could help information grow and therefore site interest.

The most important challenge will of course be to obtain restricted data and rights to use it (from rail operators for instance…).

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Webography

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